

10. MAY. 2001 15:54

WRAY AND ASSOCIATES

NO. 083

P. 15/28

WO 00/28216

PCT/AU99/00992

- 10 -

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A piston pump for a liquid, comprising:

5 a piston provided in a housing, comprising a piston body, valve means provided in the piston body, and seal means provided between the piston body and the housing;

a drive shaft operatively connected to the piston body for reciprocal motion therewith, the drive shaft being shaped and configured such that substantially equal volumes of liquid are displaced on initial and return strokes of the drive shaft.

- 10 2. A piston pump as claimed in claim 1, wherein the drive shaft has a cross-sectional area of between 40% and 60% of that of the housing.

3. A piston pump as claimed in claim 2, wherein the drive shaft has a cross-sectional area of between 45% and 55% of that of the housing.

- 15 4. A piston pump as claimed in any one of the preceding claims, wherein the housing has an outlet provided adjacent a closed end thereof remote from the piston, the closed end of the housing having an aperture provided therein arranged to receive the drive shaft therethrough, and further seal means provided between the drive shaft and the closed end.

- 20 5. A piston pump as claimed in claim 4, wherein the drive shaft is hollow to define a cavity therein.

6. A piston pump as claimed in claim 5, wherein the cavity is filled with a substance that is buoyant compared to the liquid being pumped.

7. A piston pump as claimed in claim 5 or 6, wherein the drive shaft is hollow to define a plurality of cavities.

10. MAY. 2001 15:55

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NO. 083

P. 16/28

WO 00/28216

PCT/AU99/00992

- 11 -

8. A piston pump as claimed in claim 7, where in the drive shaft is formed from a plurality of lengths of conduit, adjacent conduits being joined at a connector comprising a central portion having an outer surface and two end portions arranged to receive the ends of adjacent conduits thereon, whereby the outer surface of the central portion is contiguous with that of the conduits.
9. A piston pump as claimed in any one of the preceding claims, further comprising a motor arranged to actuate a crank arm connected to the drive shaft, and means for constraining the motion of the crank arm at its connection to the drive shaft.
10. A piston pump as claimed in claim 9, wherein the means for constraining comprises a wheel attached to the crank arm, and a channel member in which the wheel is received to constrain its motion, the channel member being provided with its channel parallel to the drive shaft.
11. In a piston pump for a liquid having a piston provided in a housing, the piston comprising a piston body, valve means provided in the piston body, and seal means provided between the piston body and the housing, and a drive shaft operatively connected to the piston body for reciprocal motion therewith, said improvement comprising the drive shaft being shaped and configured such that substantially equal volumes of liquid are displaced on initial and return strokes of the drive shaft.
12. A piston pump as claimed in claim 11, wherein the drive shaft has a cross-sectional area of between 40% and 60% of that of the housing.
13. A piston pump as claimed in claim 12, wherein the drive shaft has a cross-sectional area of between 45% and 55% of that of the housing.
14. A piston pump as claimed in any one of claims 11 to 13, wherein the housing has an outlet provided adjacent a closed end thereof remote from the piston, the closed end of the housing having an aperture provided therein arranged to

WO 00/28216

PCT/AU99/00992

- 12 -

receive the drive shaft therethrough, and further seal means provided between the drive shaft and the closed end.

15. A piston pump as claimed in claim 14, wherein the drive shaft is hollow to define a cavity therein.

5 16. A piston pump as claimed in claim 15, wherein the cavity is filled with a substance that is buoyant compared to the liquid being pumped.

17. A piston pump as claimed in claim 15 or 16, wherein the drive shaft is hollow to define a plurality of cavities.

10 18. A piston pump as claimed in claim 17, wherein the drive shaft is formed from a plurality of lengths of conduit, adjacent conduits being joined at a connector comprising a central portion having an outer surface and two end portions arranged to receive the ends of adjacent conduits thereon, whereby the outer surface of the central portion is contiguous with that of the conduits.

15 19. A piston pump as claimed in any one of claims 11 to 18, further comprising a motor arranged to actuate a crank arm connected to the drive shaft, and means for constraining the motion of the crank arm at its connection to the drive shaft.

20 20. A piston pump as claimed in claim 19, wherein the means for constraining comprises a wheel attached to the crank arm, and a channel member in which the wheel is received to constrain its motion, the channel member being provided with its channel parallel to the drive shaft.